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THE UNIVERSITY OF HONG KONG

DO DEVELOPERS ALLOCATE A LARGER FLOOR AREA TO FLATS WITH BETTER VIEWS?

A DISSERTATION SUBMITTED TO

THE FACULTY OF ARCHITECTURE

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DEPARTMENT OF REAL ESTATE AND CONSTRUCTION

BY

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HONG KONG

APRIL 2007

Declaration

I declare that this dissertation represents my own work, except where due acknowledgement is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualification.

Signed: _____

Name: _____

Date: _____

Abstract

The importance of relative price theory, or so-called Alchian and Allen Theorem, has been widely recognized in economic literature. It has been used to elucidate changes in demand among commodities of different grades under an imposition of a fixed charge. This study attempts to apply relative price theory to building designs associated with seaside developments in Hong Kong.

A quantitative approach including paired t-tests and multiple regressions was taken to examine the implication of Alchian and Allen theorem on area allocation to flats with sea views. Floor area data was collected from 84 buildings of 23 different private estate type seaside developments in Hong Kong.

The study consists of two research questions: 1. whether or not a larger area is allocated to flats with sea views than to those without; and if so, 2. why a larger area is allocated to flats with sea views than to those without.

The results indicate that the presence of sea views has a significant effect on area allocation. For seaside buildings, more area is allocated to flats with sea views than those without. In addition, the better the views, the larger the area allocated. It is shown that 5.58% more area is allocated to flats with full views than those with partial views.

These results correspond to the predictions of the theory, implying that the developers expect larger area consumption when building flats with better views. Future studies should examine more closely on the fixed cost assumptions, and the effect of height on views can be tapped, such as changing area allocation on different floor levels.

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All errors in this dissertation are mine.

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Chapter One

Introduction

In all likelihood, properties are purchased as finished goods from developers[1]and microscopically, purchasing a flat is equivalent to buying a basket of various attributes. Then, a developer is analogous to a cook, who formulates the recipe for a dish (a flat). In a dish, there may be meat, vegetables, and sauce; to choose among a diversity of ingredients, a cook has to devise a combination where different ingredients are in the right proportion. Likewise, for a flat, there are various attributes such as area, views, orientations, décor, furniture and so on. A developer has to decide what kinds of attributes and how much of each to be put into individual flats. Such decisions are then embodied in building designs. This raises the question of what the 'right' recipe is, and whether or not there is an underlying principle governing this recipe. Answers to these questions allow developers to maximize their profits. Failure to observe market demand entails shortage or oversupply, and hence lower profits.

The above idea forms the starting point of this dissertation. And the chapter

[1] For bread, consumers can buy those ready-to-serves from a bakery; if they want to make their own bread to suit their tastes, it is still easy for them to obtain the ingredients: flour, sugar and raisins, which are all readily available from the market. Manipulations of property, however, are a far more complicated process that the ingredients are changed to land, a variety of building materials, and a technical, labour-intensive construction process is involved. Both procurement of the make-up and the production are tedious, complex, and costly. It could be a convincing reason why the vast majority of property developments rest on specialized developers, and flats are sold to buyers as ready-made commodities.

continues to establish the background and organization of the study. Beginning with the two flat attributes of interest — floor area and sea view, the characteristics are discussed individually. Then, it is a simplified description on how each attribute is linked to building design, and how they are linked to one another, where the core of the study is spelt out. After that, views on the connection between the two attributes and constraints of building design are given to identify the gap for research. The aims, research questions and organization of the study are shown in the last two sections.

1.1 Overview of the study

1.1.1 Different attributes of a flat: floor area and sea view

Floor Area

Floor area constitutes the fundamentals of a flat. It is the foremost consideration for occupation because it represents the spatial characteristics and hence affects the use and functionality of a flat. It confines occupants' activities such as accommodation and storage. A spacious living environment is comfortable, with lower household density. Thus from the perspective of purchasers, it is one of the dominant factors affecting their decisions.

Sea View

Hong Kong is often associated with the feelings of congestion and crowdedness. It is one of the cities with the highest population density in

the world, with 6,100 persons per square km[2]. And, astonishingly, developable land in Hong Kong is very limited[3]. More than 70% of land is hilly and not suitable for development. Coupled with the land rationing policy[4], land supply is in fact very limited (Bertud 1997). Consequently, high-rise, high density developments are ubiquitous in the region. Buildings are erected side by side, with little space in between; they are close enough to even let one see across the adjacent flat. This mode of development draws criticisms of poor ventilation and natural light, as well as little privacy. Furthermore, different land uses concentrated in the area lead to interface problems. Especially in some old built-up areas with no planning in the past, residents may be adversely affected by, air and noise problems typically found in incompatible neighbourhoods.

As a result, developments with a pleasant landscape are precious in Hong Kong. A natural sea view featuring sea breeze, moving water, and unobstructed air space is considered as the most valuable landscape. People generally find a sea view desirable and enjoy watching it. Fung Shui believers particularly have an affinity for sea views, which are regarded as aggregation of wealth. Thus a sea view is often a striking selling point for selling of flats. For instance, Grand Promenade[5] is tagged 'possessing nearly 270 degrees pan-harbour views spanning the coast line' while Residence

[2] Fung, B.C.K. 2001. Planning for High-density development in Hong Kong. Cities Summit 2001, Singapore August 2001 [online]. Available from: www.pland.gov.hk/press/speeches/highden_dev.pdf [accessed 23 March 2007]

[3] In 2004, it is recorded as 26200 hectares, only accounting for 24% of the total land area (110700 hectares) (Legco 2006).

[4] The land disposal is by means of auctions, tenders and private treaty grant. With regular land sale suspended after economic turmoil, only 42.7 hectares of land was disposed in 2004/2005 (0.16% of the developable area); Hitherto the suspension, the land disposed was just 156.5 hectares (0.59% of the developable area) in 1997/1998 (Legco 2006).

[5] Grand Promenade. Available from http://www.grandpromenade.com.hk/ [accessed 23 March 2007]

Bel-air[6] in Cyberport is advertised for its 'superior, panoramic seaview'. Numerous developments are also named in connection with sea, like Harbour Coast in Hung Hom, Harbourfront and HarbourSide in Tsim Sha Tsui.

The presence of a sea view has been recognized to add a considerable premium to property prices in literature (e.g. Bond et al 2001, Bourassa et al 2003). Without the aid of hedonic model, the existence of added-value is still easy to be realized. Like the Arch, the three-bedroom apartments with a seaview were sold at HK$18,000 psf, 63% higher than those without priced at HK$11,000[7]. Similarly, flats with a seaview in Taikoo Shing called for rentals from HK$28 to HK$30 per sq. a month, as compared with HK$17 psf for units without the view[8].

These scarce and invaluable waterfront sites hence call for high prices in land sale. In recent years, there have been many debates over the use of prime sites for building public housings[9]. Besides, any blockages or degradations of the views by developments usually catch the attention of the site owners and cause discontent or protest[10].

In sum, sea views are highly valuable landscapes in Hong Kong. The widespread affection for sea views is evidenced by the prevalence of its

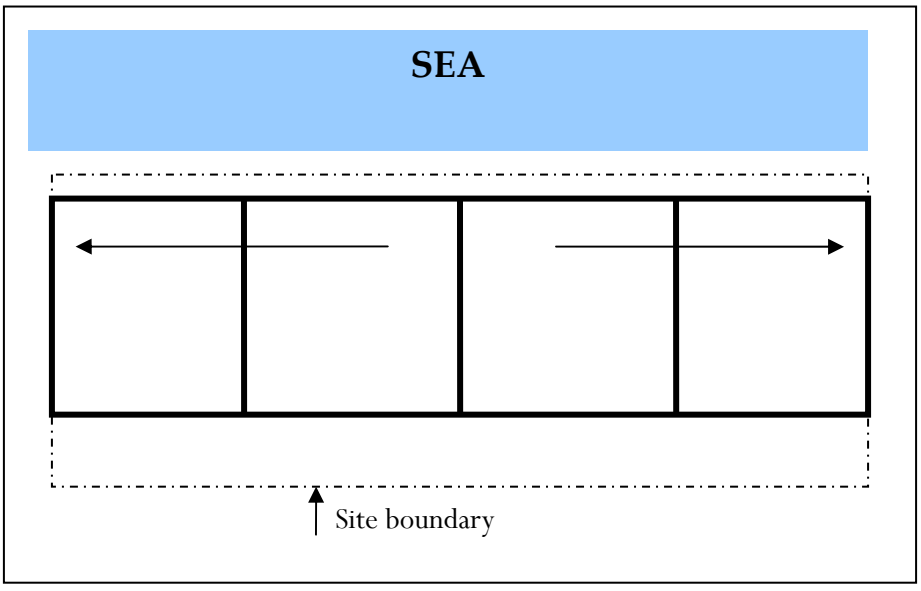
[6] Residence Bel-air. Available from www.bel-air.com.hk/cyberport/jsp/home.html [accessed 23 March 2007]
[7] Eli, L. 2005. 500 flats at The Arch sold in less than 12 hours. *The Standard*. 18 April.
[8] Sito, P. 2005. Bad news for flat tenants. S*outh China Morning Post*. 16 March.
[9] South China Morning Post. 2006. Policy on location of public housing overdue. *South China Morning Post.* 22 May.
[10] Sito, P. 2004. A few cautionary words for the eager buyer. *South China Morning Post*. 24 March.

emphasis in property sale. It is certain that development potential of land is greatly increased in the presence of sea views, and this is then reflected in prices of the properties in the market. Destruction or minimization of views equals to price drop and the flat/site owners suffer losses. Therefore, the significance of sea views on developments is undeniable.

1.1.2 Building designs regarding the attributes

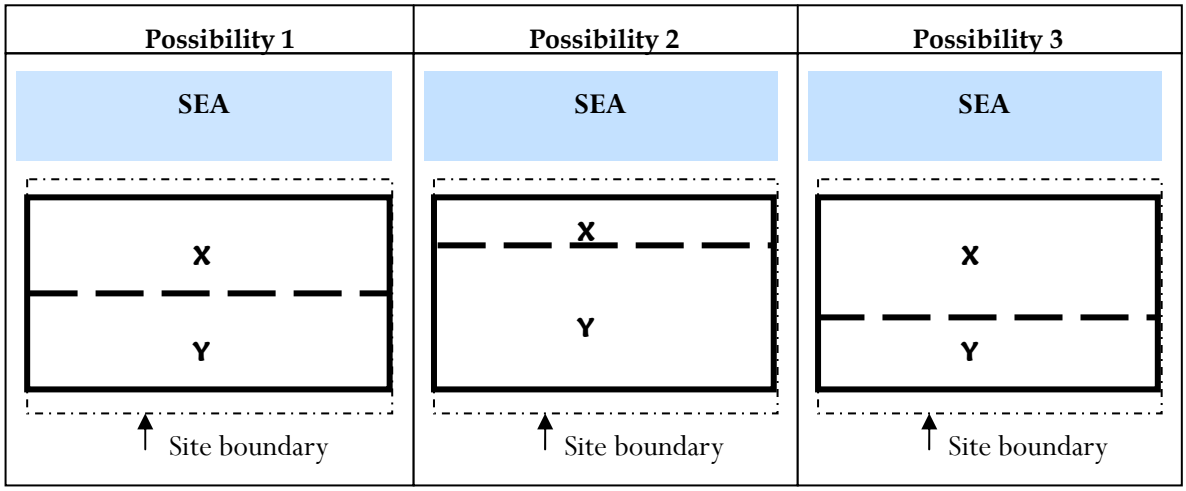
With regard to the best sea view, it easily follows that in designing buildings, developers would maximize parameters of the development facing the sea to attract buyers. For example, by way of illustration in Figure.1, the perimeter of the building is extended as long as possible to capture the optimal enjoyment of the landscape.

Figure.1: Maximizing the Perimeter of a Building along the Seaside



As for building designs regarding area, instead of having one single large flat occupying the whole floor, it is common to divide the floor into smaller units. For simplicity, division may be done in two directions: across the seaside, or parallel to it. The latter case results in some units with sea views and some without (call X and Y respectively). As demonstrated by the two-unit example in Figure. 2, concerning the relative area allocation to the X, Y two flats, there are three possibilities resulted from the division: 1, the area is equally shared between X and Y; 2, the area allocated to Y is larger than X.; and 3, the area allocated to X is larger than Y.

Figure.2: Two-unit Example



Intuitively, under normal circumstances, there is no difference among these three possibilities to developers. But, when it occurs to seaside developments, real world observations suggest that examples of possibility 3 are prevalent, while examples of possibility 2 are rare. Take a seaside development, Provident Centre in North Point (Figure.3) as an example. In the first place, it can be seen that the residential blocks are built along the waterfront in order to maximize the seaview; secondly, floor plans shown in

Figure. 4, which are collected from two buildings in the development, clearly indicate that a larger area is allocated to X (flat with a sea view) than to Y (flat without a sea view). Figure.5 shows the floor plan of another development, South Towers Residence Bel-air in Pokfulam. Coincidentally, it also demonstrates Possibility 3 but not the other two. As discussed previously, size of flats and a view of sea are different and separate considerations from purchasers' point of view. Purchasers may like to buy flats with (without) a view, and they may choose to buy larger (smaller) flats. There is seemingly no connection between such two decisions, neither in a corresponding nor conflicting way. It is puzzling why the area allocation seems to be influenced by the presence of building views, or more specifically, why many developers would associate and tie sea views with larger floor area in a purchase.

Figure.3: Provident Centre in North Point

Figure.4: Floor plans of Provident Centre ***(Source: Centamap 2007)***

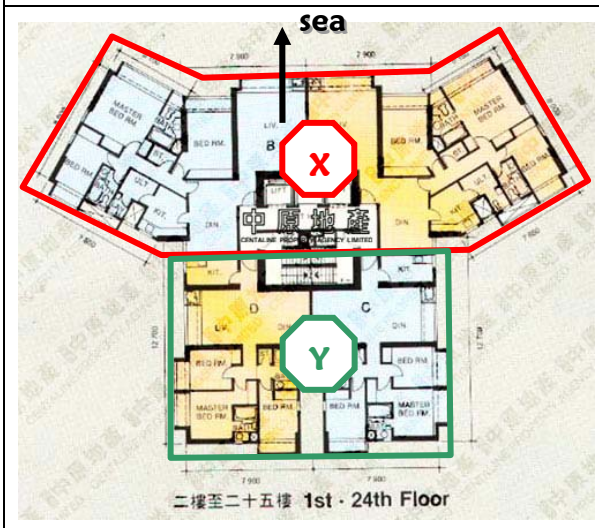
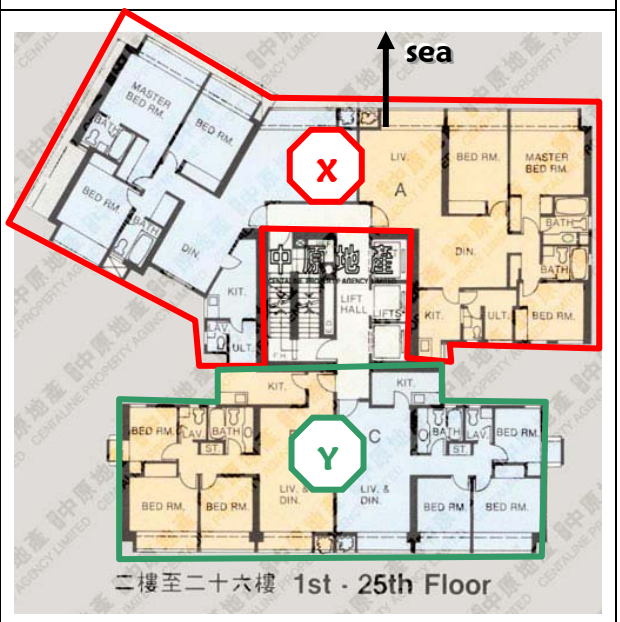
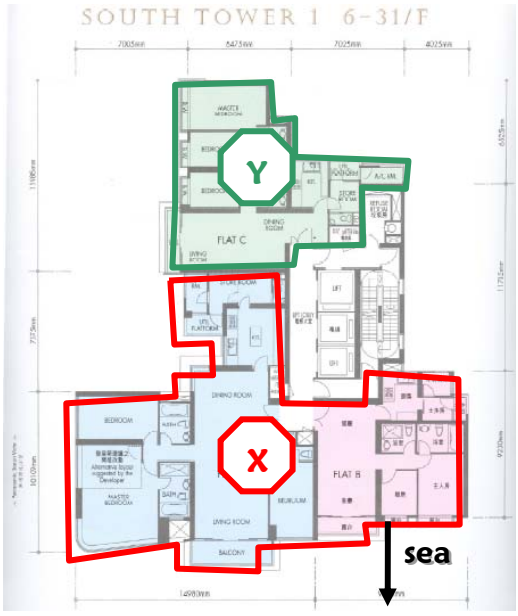
Tower 1 (1-25/F)	Tower 3 (1-25/F)
	

Figure.5: Floor plan of South Towers Residence Bel-air ***(Source: Centamap 2007)***

Tower 1 (6-31/F)


1.2 Different Views on the Tie-in of Sea Views with a Larger Floor Area

Prior to more extensive discussions, it is better to restate the situation identified in the last section. The attributes, sea views and floor areas, are considered as two different economic goods: goods are scarce such that one prefers to have more, and utility can be derived from consumption of goods. As identified by this study, a larger area is allocated to flats with sea views than ones without in many cases. In other words, there appears to be a tie-in sale of sea views with a larger floor area. If someone likes to purchase a flat with a sea view, they are required to buy one with a larger floor area as well. Admittedly, the purchases of sea views and areas are inseparable; what remains a puzzle is why larger areas (not the same or smaller) are tied to the sale of sea views, or why larger areas are needed to enjoy the views.

This section gives a summary of the existing viewpoints regarding the above phenomenon. Diverse views have been put forward in an attempt to explain the linkage of larger area allocation to flats with a sea view. These views include greater receipt, privilege, market segmentation, and complementary effect.

1.2.1 Greater Receipt

The most common myth is that a flat with a sea view asks for a higher unit area price than that without, so sales revenue can be higher by multiplying a higher unit price by greater floor area. It is fallacious as the unit area price is simply an averaged measure of the entire price, which is in fact a sum of

prices of different attributes in a particular flat. Therefore, the sellers receive nothing more than what they are selling.

1.2.2 Privilege

One suggests that as a buyer pays a greater price for a larger flat, she is a bigger customer. Therefore the developer should give this customer the priority to buy flats with a sea view.

This argument is untenable since developers cares only about the proceeds; they are indifferent to who gets the sea view as long as they make the same revenue. That is to say, if the buyer of a smaller flat is willing to pay for the sea view, the developer would be pleased to sell without doubt.

1.2.3 Market Segmentation

Another view considers this kind of area allocation as a tool to segment the market. It is thought that area purchased is linked to income level of buyers: income level of buyers of larger flats should be higher than that of smaller flats, and that the former are willing to buy sea views for higher prices.

This causal relationship between income level and purchasing of flats with sea views, or between income level and higher payment are questionable. The price should be dependent on the information known to the buyers. Even if it were the case, then for any building with a view, a developer would maximize the area of flats so as to attract customers of the highest possible income level. As a result, every single flat would occupy the whole floor.

However, abundant empirical evidence shows the floor is divided into smaller units. The argument therefore does not sustain.

1.2.4 Complementary Effect

The last view on the area allocation suggests that area is complementary to sea views. That means for better enjoyment of the view, a larger flat area is required.

However, enjoyment of a sea view is a subjective matter. Some people may link it to size of the windows, or to which rooms facing the view. Others may think it is solely dependent on the breadth of a sea view, and has nothing to do with the building design. Therefore, this argument is conceivable but difficult to justify as different people have different tastes.

As we have seen in this section, none of the explanations seem to be convincing enough. They are either not testable, or refuted by logic and empirical evidences. The next section looks at whether any building design constraints imposed by development controls explains the tendency of area allocation.

1.3 Constraints on Building Designs

Like other countries, developments in Hong Kong are under a spectrum of controls. These controls include land leases, Town Planning Ordinance[11],

[11] Town Planning Ordinance, Cap 131

and Building Ordinance[12]. Wong (2003)[13] gave a general account on development controls regarding the design of private residential buildings. The first kind of control by leases conditions may generally specify the maximum limits concerning total gross floor area (sometimes also minimum limits), plot ratios, site coverage, units and numbers of storeys. These restrictions mainly focus on the building bulk to restrain the developable area, similar is true in the other two kinds of controls. In addition to that, Outline Zoning Plans made under Town Planning Ordinances also regulate parameters such as density, building heights, compatibility of use, open space provision, environmental consideration, and public flight path. These parameters usually consider the master layout and the amenities of the development as a whole, rather than individual buildings. The last type of control, Building Ordinance, is more extensive and some restrictions are specifically on building designs. Building (Planning) Regulations encompass restrictions over building projections, heights, site coverage, plot ratio, open spaces, lighting and ventilation, staircases and special provisions for fire safety as well as disability. Such restrictions may limit design flexibility such as orientations and shaping of buildings, configuration of rooms and window provisions in contemplation of lighting and ventilation, as well as inclusion of provisions or facilities such as staircases.

This short section provides some supplementary information on the considerations involved in building designs, or better still, external constraints imposed on developments. It is found that there are no

[12] Building Ordinance, Cap 123

[13] Wong, W.S. 2003. *The Effects of Building Regulations Control on the Design of Private Residential Buildings*. Ph. D. Thesis, The University of Hong Kong.

expressed or implicit constraints related to area allocation. In other words, the decision of area allocation is totally in the hands of the developers.

1.4 Aims and Research Questions

Virtually no research has ever been carried out on the association between sea views and floor area. The vast majority of property literature has focused on the respective effects of floor area and of building views on property values (details in Section 2.3). Speaking of tie-in sale generically, analyses in economic literature are offered on a case-by-case basis, there is no unanimous theory to generalize the phenomenon. Moreover, the discussion so far has not shed much light on the way in which the goods are tied (say, relative proportions of different goods), but is rather limited to reasons behind the tie-in sale (details in Section 2.1).

The author proposes that relative price theory (or so-called Alchian-Allen Theorem) may be a possible solution. The theory proposes that in view of an imposed fixed cost, people will respond by demanding more relatively cheaper high-quality goods, thus a larger fraction of high-quality goods are sold in comparison with low-quality goods (details in Section 2.2). In this context, if the premium embedded in land costs due to sea views is taken as a fixed cost, people must pay the same irrespective of the quality of goods (area). As established in Section 1.1, sea views are publicly regarded as the most valuable landscape among all. Area of flats with sea views are said to be high-quality goods compared with that of flats without the views. Because of land premium imposed on all flats of seaside development, the

area of flats with sea views (high-quality goods) becomes comparably cheaper, and people would buy more of it. Consequently, larger area is allocated to flats with a sea view, which is Possibility 3 previously shown in Figure.2.

Earlier on in the chapter, the significance of sea views on residential properties is identified, laying a sound basis for the investigation of building layout associated with seaside developments. In this study, two research questions are examined:

1. Is larger area allocated to flats with sea views than those without the views?
2. Why is more area allocated to flats with sea views than those without the views?

The aim of the study is hence to fill the gap of research by applying the relative price theory to building designs. It is further broken down into two objectives:

1. To investigate the relationship between sea views and area allocation.
2. To establish the relationship between quality of sea views and area allocation.

1.5 Organization of the Study

This chapter is the Introduction of the study. The dissertation proceeds as follows: Chapter Two is Literature Review. The author critically reviews the literatures with respect to tie-in sale, relative price theory, and value of sea views to properties. For tie-in sale, the reasons and choices of goods in a tie-in are discussed. For relative price theory, conditions of theory and empirical studies are reviewed. And the values of different qualities of sea views to properties are given at the end. Chapter Three is Methodology. It introduces the hypotheses based upon the literature in previous chapters and outlines the research methodology. A paired t-test and multiple regressions analysis are used to test the proposed hypotheses, after which collection of data of seaside developments in Hong Kong is discussed. Chapter Four is Empirical Results. It presents the summary statistics of the empirical results, and also discusses the findings. Chapter Five is Conclusion. It offers a summary of results and discusses the contributions, limitations, as well as recommendations for future studies.

Chapter Two

Literature Review

This chapter provides a critical review on the economic literature with regard to the main theme of the study, that is, the tie-in sale of larger areas and sea views. First, the tie-in sale is concerned generically, where the central notions are discussed within the historical contexts. Then the relative price theory is introduced, and the elements in the idea, relevant critiques as well as empirical studies are presented. The last section examines the accepted insights regarding sea views and property.

2.1 Tie-in Sale

The sellers' unusual behaviour of associating selling of one good with another has interested economists since a long time ago. Tie-in sale has provoked general discussions in the economic literature. The common definition of a tie-in sale given by Burstein (1960) is 'one in which the seller of the tying good require that one or more other goods used with the tying good also be purchased from him (p.68).' To address the differences in arrangements of the purchases, there exist finer classifications, which can be summarized as three main types. The first one is bundling, which refers to simultaneous purchase of multiple goods for one price. It is further sub-categorized in terms of the extent of adoption as pure bundling (goods sold only in packages) and mixed bundling (goods sold separately as well as in packages) (e.g. Adams and Yellen 1976; Jeuland 1984). Another type is tying, in which a contractual agreement over subsequent purchases of the tied good is involved

(Wollenberg 1987). The last type is full-line forcing as a more restrictive version of tying, which involves purchase of all requirements pertaining to other goods from the seller (Burstein 1960).

Over the last couple of decades, debates have mostly focused on tie-in sales in general terms or tying alone, while those particularly on the other two types are few. In 1900s, tie-in sales were frequently linked to monopolist power and perceived negatively as exploitation tactics by the sellers, hence attracting criticisms. Early discussions therefore tended to be associated with anti-competition acts in law literature (e.g. Markovits 1967, 1970; and Austin 1977). In such contexts, economic analyses were carried out with the aim of seeking grounds for defense (e.g. Wheeler 1972). The classic cases include *the International Salt* and *Paramount* (Turner 1958). Although examination of legal theories and analyses of facts are beyond the scope of this dissertation, monopolist power appeared to be of high significance in the controversies.

Due to frequent linkage to monopolist power, a widespread debate over the motives of engagement in tie-in sales was sparked off in the economic literatures. The vast majority of the discussions have focused on the incentives or reasons for tie-in sales, with occasional reference to profitability analyses.

2.1.1 Reasons for Tie-in Sale

Despite the ever active debates over tie-in sale in the literature, the crux of arguments essentially lies in whether the outcomes of the tie-in are derived

from the better utilization of monopolist power or the extension of it. In other words, the motives are judged by the outcomes of the tie-in. It follows that there are two major postulates of the tie-in—price discrimination and leverage theory, which have gained great support from advocates as the key to explain the practices.

Price discrimination

In the mid twentieth century, in view of per se rule adopted by law, many literatures made considerable efforts in search for alternative explanations on top of leverage. Price discrimination gained a general acceptance at that time. Stemming from differences in utility values of people, the notion suggests that sellers are able to gain by charging different people differently to extract their consumer surplus. This postulation underscores tying as mere utilization of existing monopoly power instead of creation of a new one (e.g. Stigler 1963).

One of the most common interpretations of price discrimination is in terms of demand elasticity, meaning that it is achieved by sorting out more intensive users from less intensive ones, and the metering function of tied goods is implied. Moreover, within a tie-in, the prices of tying goods are necessarily lowered while the prices of tied goods are raised in the tying arrangement to generate revenue (Burstein 1960; Ferguson 1965). On the other hand, this idea of price discrimination was usually explicated in the context of specific examples. Bowman (1957) used the famous example of tying a patented machine with shoes staples to demonstrate tied product serving as a counting device for setting discriminatory prices on the tying product. Ferguson's

arguments (1965), on the other hand, revolve around the example of machine and punch cards. He regarded tie-in as an alternative policy in which direct price discrimination is difficult owing to lack of knowledge of individual demands, and prohibitive costs to separate groups.

Apart from the metering devices hypothesis, another interpretation of price discrimination is by means of differentiations inherent in customers' values towards goods. Stigler (1963) claimed that price discrimination was responsible for the pervasion of block-blocking used to capture returns as relative values of films varied from one city to another. Adams and Yellen (1976) stated that price discrimination is succeeded by complete extraction, exclusion and inclusion, whereas in bundling customers are sorted into groups with different reservation price characteristics. Schmalensee (1982) advocated that tying reduces heterogeneity due to different reservation prices so as to extract more consumer surplus.

Leverage theory

Basically, the gist of leverage theory suggests that foreclosure of competitions in one market is through the use of power developed in another market (Markovits 1967). During the period during which price discrimination belief was prevalent, one argument against leverage was that separate selling of monopolized goods or selling in a bundle does not make a difference in the number of goods sold (e.g. Stigler 1960). Bowman (1957) argued the likewise, suggesting that by observance of effect on supply of output of a tied product, no additional monopoly is said to be present if the same output of the tied product can still be competitively produced.

Around the late nineteenth century, there were more discussions in favour of leverage theory. And the leverage studies were no longer confined to analyses from consumers' perspectives, but extended to the effects on rivals' profits and changes in the market structure.

Whinston (1990) noted that tying can affect the profit of operations of the tied goods rivals. He further analyzed that in the case of homogenous preference of monopolized good, precommitment is essential. Thing are different in the case of heterogeneous preference: although the foreclosure or diminishment of profits of tied good rivals may not necessarily follow, tied product rivals still have some of their sale foreclosed and continue unprofitable operation, so that the exclusion of rivals is possible via predation. He further suggested that tying of complementary products in fixed proportions has exclusionary effect only when the tied goods have more uses than the monopolized goods.

On the other hand, Carbojo et al (1990) argued that imperfect competition is enough to create a strategic incentive to bundle, as the decision to bundle necessitates a change in the behaviour of non-competitive tied market rivals. Especially in Cournot Competition, bundling is potentially profitable if a firm precommits a higher production levels, such that the increase in market share is sold above cost and non-bundling firm experiences a fall in profit. By contrast, both monopolist and rivals are benefited in Bertrand competition, as bundling differentiates the monopolist's product from that of its rivals. The monopolists can raise price above cost, and rivals are induced to raise price, making bundling profitable. Such mutual beneficial situation among

bundling firms and rivals was also suggested by Seidmann (1991) in his game analyses.

The recent studies on tie-in have brought a special focus on technological tying, as exemplified by the important Microsoft case. Choi and Stefanadis (2001) stated the component of risky innovation investment in the analysis of tying effect. They reasoned that tying of complementary products made by any successful entrants have to gain successes in both products, this uncertainty causes disincentive to the entrants. Similar studies on Microsoft tying to Internet Explorer and Windows were done by Klein (2001) and Whinston (2001). Moreover, Carlton and Waldman (2002) added that the deterrence effect is particularly found in industries characterized by substantial innovation with short product lifetimes, during which primary market entry is impossible. The network externalities were also explored, which have similar effect as complementary products.

2.1.2 Choices of Goods in Tie-in sale

For the choices of goods engaged in a tie-in sale, discordances come into sight over the requirements. The normal belief of complementary goods stemmed from metering cases, in which the goods are used in conjunction with each other so as to measure the intensity (Ferguson 1965). The majority of leverage theorists have favoured the complementary relationship of goods—especially in technological tying—while others found independence of goods is sufficient. Burstein (1960) proposed that tying agreement be taken as a means of extracting the profit inherent in an all-or-nothing selling

arrangement, in such a way that the complementarity of tied and tying good is not essential in his mathematical analysis. Using the example of tying of radio tubes and salt, he suggested that the goods to be tied to be which the buyers had previously purchased, and that the price elasticity of the tied goods not be too high. Adams and Yellen (1976) also adopted the assumption of independent goods in their model. Mathewson and Winter (1997) argued that tying is profitable even when the two products are independent as demands would be stochastically dependent. There are also advocates for the substitutability requirement. Goods bundled were suggested to be negatively correlated in Stigler's notable explanation (1963) for block-booking of matching superior and inferior films together. Schmalensee (1982) also had a similar assertion of negative correlations and suggested that this, together with a high level of demand, allows reduction in heterogeneity for greater consumer surplus extraction and so higher profit.

2.1.3 Limitations of the Analyses on Tie-in Sale

In spite of an enormous number of studies devoted to the analyses of the tie-in sale, some limitations are observed.

Firstly, there is proneness of analysis to be undertaken on a case-by-case basis, and no single theory can generalize the phenomena. For example, price discrimination with counting implications is not attributable to all kinds of tie-in sale, but rather to restrictive examples like machine and complementary components. Similarly, in Bowman's (1957) paper, other than price discrimination, he identified four other situations, namely, evasion of price

regulation, product complementary in a variable proportions context, technological interdependence, and economies of joint sale. Similar specifications of cases were given by Ferguson (1965).

Another limitation is limited or trivial empirical support for the postulations. For instance, in the metering case, a number of researchers criticized the empirical approach of comparing the price differentials per period. As Hansen and Roberts (1980) argued, price comparisons are only meaningful provided that the possibility of dissimilarities in the items purchased is effectively removed. Thus the observations on differences per period prices paid by different customers do not verify price discrimination since all users indeed pay the same price for a unit of the durable in the present value term (see also Cheung 2006).

In addition, regarding the price discrimination in terms of differential reservation prices, although Adams and Yellens's noteworthy paper (1976) gave special attention to bundling and made an attempt to analyze different types of profitability, the results were held indeterminate without the knowledge of consumers' reservation prices distribution and the structure of costs. Numerous attempts were made to ascertain the profitability by adding specific conditions such as Gaussian demand in Schmalensee (1984), homogeneity and heterogeneity of customer preferences in bundle with variable proportions in Ormiston and Philips (1988) as well as McAfee et al (1989). The results were still full of uncertainties.

2.2 Relative Price Theory

Relative price theory (a.k.a. Alchian-Allen Theorem) was expounded by Alchian and Allen and first explicitly appeared in text in the book *"University Economics"* in 1964 (Alchian and Allen 1972). Its core idea resides in the intrinsic qualities within a commodity as recognized in literatures (e.g. Barzel 1982). Taking heed of the complexity of a commodity, Alchian and Allen argued that the hidden effects on the intrinsic attributes should also be addressed on top of the straightforward analysis of price change upon fundamental law of demand.

To illustrate this idea, Alchian and Allen utilized the example of grapes selling in California and New York, they wrote (1972),

> Suppose that grapes grown in California cost 5 cents a pound to ship to New York, whether the grapes are "choice" or "standard" (poorer), that the production of grapes is 50 percent "choice" and 50 percent "standard", and that in California the "choice" grapes sell for 10 cents a pound and the "standard" for 5 cents a pound (in California 2 pounds of "standard" and 1 pound of "choice" grapes sell for the same price). If grapes are shipped to New York, the shipping costs will raise the cost of "choice" grapes to 15 cents and of "standard" grapes to 10 cents. In New York, then, the price of "choice" grapes is lower, relative to "standard" grapes (1.5 to 1), than in California (2 to1). To buy 1 pound of "choice" grapes in New York would mean a sacrifice of 1.5 pounds of "standard," whereas in California it would cost 2 pounds of "standard." According to out first law of demand, New Yorkers, faced with a lower price of "choice" relative to "standard," will consume relatively more "choice" grapes than Californians. In

> California, where “standard” grapes are cheaper relatively to “choice” grapes, a larger fraction of “standard” should be consumed. And it is so. (p.71)

The numerical example above demonstrates how the relative prices of high-quality goods and low-quality goods are changed because of a fixed cost. As a result, a larger fraction of the high-quality goods is expected to be consumed. Although the example was changed to apple, Umbeck (1980) reinterpreted that the transportation cost is likened to an admission fee to obtain the container (apple peel) while the quality is quantified as juices priced per unit. As he stressed, ‘The price of juice at the margin has not changed, it is still 10 ¢ for the extra unit. Only the admission fee has increased….this implies that they will purchase apples with more juice in them: higher quality apples (p.205).’ Putting it into another way, the imposed cost is fixed irrespective of the quality of goods. The inference of quality adjustment resulted from the theory was further explained by Staten and Umbeck (1989). As its predictive power can be extensive, some people regarded it as the third law of demand (e.g. Bertonazzi 1993).

Literatures built upon the relative price theory are few. They are mostly linked to tax policies. For example, Barzel (1976) changed the transport cost to tax or other restrictions and extended it to supply-side analysis. He suggested that tax is imposed on one or some characteristics of a commodity, but hardly on all. Similarly, Santoni & Cott (1980) suggested that restriction of quota induces adjustments in product characteristics.

2.2.1 Conditions of Relative Price Theory

Simple as it may seem, relative price theory offers important insights in interpreting consumption due to a price change by taking dimensions of quantity and quality into account. However, since the theorem was conveyed in the form of examples, the principal conditions are vague and not explicitly spelt out. Such ambiguity results in criticisms with respect to the assumptions of the theory and also its predictive power. There are two main arguments: one on the condition of third-good world and another one on the fixed charge.

Concerning the third-good world argument, Gould and Segall (1969) reported the opposite result that a larger fraction of lower-quality goods is consumed in their mathematical analysis. Borcherding and Silberberg (1978) added the relationship of close substitutes between higher and lower quality good as a necessary condition to preserve the validity of the theory. Umbeck (1980) argued that the incorporation of third-good reinforces the proposition. His logic is that some individuals impeded from buying due to the admission fee would divert to the substitutes or turn away from complements. Consequently, the price of substitutes rises and that of complements drops, both contributing to the demand for those who continue to buy the goods. A recent paper by Bauman (2004) made an attempt to derive the necessary conditions mathematically in n-good world and considered two cases that necessitate the expected results. In the first case, assuming that high- and low-quality goods are close complements, low-quality goods should have better substitutes or poorer complements than high-quality goods. The other

case is granted the reverse—high-quality goods should have no better substitutes or poorer complements than low-quality goods.

As for the fixed cost, there are three requirements. The first and second requirements are that the imposed charge should be fixed and used to gain access to the other goods. The third requirement, which attracted the most attention, is that the fixed charge should be of no value on its own. In one sense, it means it should inflict no change on the goods. Counter examples of good farm produce and delectable lobster given by Gould and Segall was rebutted by Borcherding and Silbergerg (1978). They pinpointed that travelers caused the incurrence of transport cost. In another sense, Umbeck objected the generalization of any cost items suggested by Borcherding & Silberberg. Instead of constraining the definition of the fixed charge as non-economic goods, he generalized all transaction cost as partly independent of and partly vary with the number of units exchanged. When only the former increases, fewer transactions but with more units exchanged in each, result. This idea greatly enlarges the predictive power of the theory to examples such as the effect posed by monthly fixed phones services charge and tuition fees.

Last but not least, apart from the two arguments mentioned above, Razzolini et al (2003) contended that the effect on the fixed charge on relative prices is ambiguous when taking the supply side into account. They asserted that the higher quality grade is relatively cheaper only if the demand elasticity for the two quality grades are the same, or that of the low quality is comparatively lower than high quality, but neither of these cases are plausible empirically.

2.3 Empirical Studies on Relative Price Theory

Empirical studies are limited, and they mostly emphasize on trade restrictions like tax and quota. The initial attempt to test the effects of tax was made by Barzel (1976), with his two hypotheses that the rise in prices due to unit tax is greater than unit tax, and that extent of increase is more than that due to ad valorem tax. He tested these hypotheses with the retail price of cigarettes data in the District of Columbia and 48 continental states in 1954-72, controlling for the shipping costs. The first but not the second hypothesis was supported by the findings. However, a number of researchers had reservations about his test and results. Johnson (1978) reexamined but found empirical evidence only for the first but not second prediction due to misspecification. Sumner & Ward (1981) raised doubts on the Barzel' s interpretation, and suggested that the price change should also takes into consideration the cost, the uncertainty of competitors' reactions, and the indivisibility of the unit. As for Sobel & Garrett (1997), they were skeptical of the assumption of full transfer of tax onto customers in Barzel's study. They retested it by using market share of the higher-quality premium-brand cigarette as an averaged measure of quality level of cigarettes. They used data on the quantities of premium and generic cigarettes purchased, collected from 51 jurisdictions, 44 of which a retail sales tax were used. These results supported Barzel's theory that for every three cents of state unit tax, there was an increase of one percentage point in the market share of premium brands, and the retail sales tax was also found insignificant as hypothesized.

Likewise, a number of researches have been carried out on quota which is

presumed to be of same effect as per unit tax. Feenstra (1988) studied the effect of quota restraint on quality change in Japanese cars in comparison with that of ad valorem tariff on truck imports between 1979 and 1985. He hypothesized that the imposition of quota reduced the quantity and led firms to substitute toward higher quality. With the quality measured by means of hedonic regressions, the effect due to changes in costs or exchange rates had to be taken into consideration. They found substantial upgrading in Japanese car imports, but ambiguous quality changes in trucks.

Studies other than tax and quota are few. Staten and Umbeck (1989) empirically tested the students' response in course enrollment to different tuition rates, with the hypothesis that the semester course load would increase with a higher semester fee. They utilized the enrollment data of University of Delaware in academic years of 1983-84 to compare course constitution of non-residential students to that of residential students, in which the former are charged with a substantially higher semester fee. Comparisons were also conducted within each major to eliminate the effect of inherent difficulties in different disciplines. The findings showed that nonresidents would take more credit hours than residents in twenty-two out of thirty cases. The difference was significant in seven out of the twenty two cases within each major. Bertonazzi et al (2003) extended the idea of Borcherding and Silberberg (1978) and tested the sale of football games tickets due to the different transportation costs.

2.3 Sea views and Property

Determination of property prices has been one of the most important aspects considered in the property literature. It is generally acknowledged that property is a commodity made up of a bundle of attributes (Ridker and Henning 1967); there has been plentiful research yet most studies addressed multiple factors simultaneously. The hedonic price model developed by Rosen (1974) has been extensively adopted to estimate implicit prices of various characteristics of properties (e.g. Darling 1973; Plattner and Campbell 1977; Bartik 1980). As a rule, the price of a house can basically be accounted to its structural, neighbourhood, and environmental characteristics (Freeman 1979). Contemporary studies maybe further sub-categorized into factors according to accessibility to work, transport, amenities, the structural characteristics, neighborhood, and environmental quality (Tse and Love 2000); some studies also include community conditions and macroeconomic market conditions (Nicholls and Crompton 2005).

The value of externalities could be attributed to the property price in the sense that the attractive or desirable environmental features can increase house value; conversely, the nuisances or undesirable features reduce values (Nelson et al 1992). The amenities, such as water views, parks, woodland, greenbelt and open space, have significant positive effect; the negative examples, on the other hand, include air-contamination site and noise area (Boyle and Kiel 2001; Simons and Saginor 2006). Apart from well-recognized natural environmental factors, Bourassa et al (2003) noted the values of landscaping and appearance of buildings in immediate neighborhood amounted to 5%

and 37% increase in property prices respectively. Wu et al (2004) also recognized that utility is affected by endogenous development amenities determined by developers, development density.

Sea views are consequentially one of the most focused externalities. Much of the existing property values research has focused on water views as central subject or a side issue. For example, Bond et al (2002) estimated a view of Lake Erie added 89.9% premium to the value of a flat. Owing to the heterogeneity of water views, a number of finer classifications are employed to better reflect the intrinsic values. Common categorizations include type and quality of the view. The latter is subdivided into proximity to water or angle of the view. For instance, Benson et al (1998) estimated values of views to single-family residential estate markets in Bellingham of Washington with respect to different types of views including ocean, lake, and mountain. The views were further classified by quality: ocean views were classified into four quality categories ranging from full ocean view to poor partial ocean view, depending on the degree of obstruction. An increase of 60% of the market price was found with the highest-quality ocean views, whereas 8% was added even for the lowest-quality ones. Moreover, the value of view was found to decrease with distance from the water. Similar approach can be found in the study conducted by Bourassa et al (2003), in which views were analyzed regarding different types of view (water and land), scope of view (wide, medium, and narrow), distance to coast, and quality of surrounding improvements. Data of sales was collected in Auckland, New Zealand. The findings showed that wide views of water added an average of 59% to the value of a waterfront property, and there was a diminishing effect as the

distance from the coast increased. Other methods to qualify views have also been used. Brown and Pollakowski (1977) related the width of setback area to the values of water view, whereas Colwell and Dehring (2005) investigated role of frontage and depth.

Besides physical characteristics of the view, like other attributes, the price of the view is in accordance to the law of diminishing marginal utility. In Wolverton' s study (1997), quality of city view was measured by metrically scaling the width of each lot's angle of city view panorama, with adjustment for blockage or potential blockage from nearby homes, varied from a low of 10 degrees of included angle to 160 degrees of included angle. The results showed correspondence to the effect of diminishing marginal values. Furthermore, the value of view also reflects the relative supply of water views property in the area, which varies with the property cycle. Bourassa et al (2005) conducted his research in Auckland, Christchurch and Wellington to investigate the effect of view on property values by three types of aesthetic externalities: water, the appearance of nearby improvements, and the quality of landscaping in the neighborhood. The research group demonstrated that the price of the aesthetic externalities changes with the real estate; also, among the water views, the percentage premiums were the highest for those in Christchurch but lowest in Wellington, corresponding to the relative supply of water views properties.

2.4 Research Gap

The previous sections review the literature concerning three different aspects, namely, tie-in, relative price theory, and the relationship between sea views and property. It can be seen that the majority of studies have been devoted to finding the motives of tie-in sales. Although there is no unifying theory, price discrimination, leverage theory and other postulations have been put forward to explain individual cases. Researchers have made efforts in clarifying conditions of the application of the relative price theory so as to preserve its predictive power in the real world. Also, many empirical studies have also been conducted on the changes in quality of goods due to tax and quota. Lastly, past research on properties has shown that sea views add values to a property, and that the value varies with quality of the view.

These studies have undeniably made considerable efforts in adding knowledge in these three areas. Yet there is still a research gap to be filled—there is a lack of studies addressing the relationship between sea views and floor area of properties. Most studies on the value of sea views in properties have focused on the values of individual attributes by means of hedonic model (e.g. Tse and Love 2000). Any possible connection between sea views and area appears has been neglected by researchers, and the effect of quantities of the attributes on each other also has not been tapped. Furthermore, there is a lack of empirical studies investigating these attributes of properties.

Chapter Three

Methodology

The previous chapters establish the rationales of the study. This chapter presents the research methodology. It starts with a restatement of the research questions and hypotheses, followed by a detailed model specification, data collection, and data analysis.

3.1Restatement of Research Questions and Hypotheses

There are two research questions in the study, as stated earlier in Section 1.4

1. Is larger area allocated to flats with sea views than those without the views?
2. Why is more area allocated to flats with sea views than those without the views?

As previously discussed in the Introduction (Chapter One), many seaside developments are characterized with larger area allocation to flats with sea views. This phenomenon leads to the current study on whether there is a tie-in sale of larger areas and sea views.

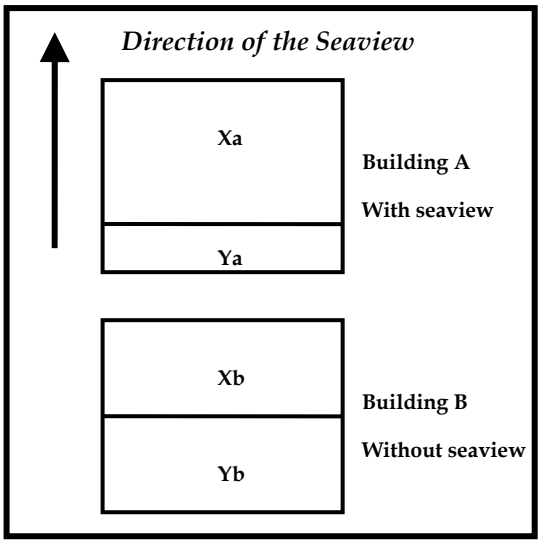
In the Literature Review (Chapter Two), the relative price theory provides an explanation that the imposition of a fixed cost (F) changes the relative prices of higher quality goods (Ph) and lower quality goods (Pl), making the former relatively cheaper (Ph+F/Pl+F < Ph/Pl). By the law of demand, imposition of

a fixed cost leads to larger consumption of the higher-quality goods (Dh'/Dl' > Dh/Dl) (Section 2.2 of Chapter Two).

In the context of seaside developments, the author conceives that presence of a sea view not only accounts for a premium for individual flats with those views, but arguably adds a premium to the whole development in the form of land costs. Also the author assumes that this portion of land costs is divided equally among all flat owners in the development.

Consequently, the part of land costs due to its sea views might act as a fixed cost in the relative price theory. It is imposed on all flats in the development and is constant irrespective of the floor area. In a seaside development, floor area of the flats with a seaview is considered as high-quality goods, while that of the flats without the view is regarded as low-quality goods. As predicted by theory, under imposition of a fixed cost, larger fraction of area of flats with a seaview is consumed, as compared with that of flats without the view. Therefore, it is predicted that more area is allocated to flats with sea views than those without. It is formulated as Hypothesis 1. The graphical representation is given by Figure.3-1.

Figure.3-1: Hypothetical Model based on Relative Price Theory



Based on Relative Price Theory, Xa/Ya of Building A is higher than Xb/Yb of Building B.

Furthermore, considering goods with a spectrum of different quality (from the lowest quality to the highest quality), it is predicted that the higher the quality of goods, the greater the percentage drop in the relative prices, and hence the larger the fraction of higher quality goods consumed. Therefore, Hypothesis 2 predicts that the better quality the sea views, the larger the area allocated to the flats with sea views than those without.

3.2 Definition of Term

This study investigates area allocation of buildings. Area Ratio (AR) is introduced for the ease of model specification. It is defined as the ratio of the sum of floor area of the flats facing seaward to the total floor area, expressed in percentage. Considering the fact that available data is mostly in the form of gross floor area (GFA), Area Ratio is operationally defined as the ratio of the sum of GFA of flats facing seaward to the total GFA, expressed in

percentage. Figure.3-2 is the illustration of calculation of Area Ratio using a typical floor plan of Tower 1of Chi Fu Fa Yuen. Three points are worth mentioning. First, it should be noted that the sea view should be coming from only one direction, which means the angle of view should not be greater than 180 degrees; otherwise, it renders AR invalid. Second, the calculation of GFA includes the net area of the flat as well as a portion of common area. But the inclusion of common area is proportional to the net floor area of a flat, so that it does not have an effect on the ratios. Third, AR is applicable to both buildings having sea views and those without; the calculations are demonstrated in Figure.3-3.

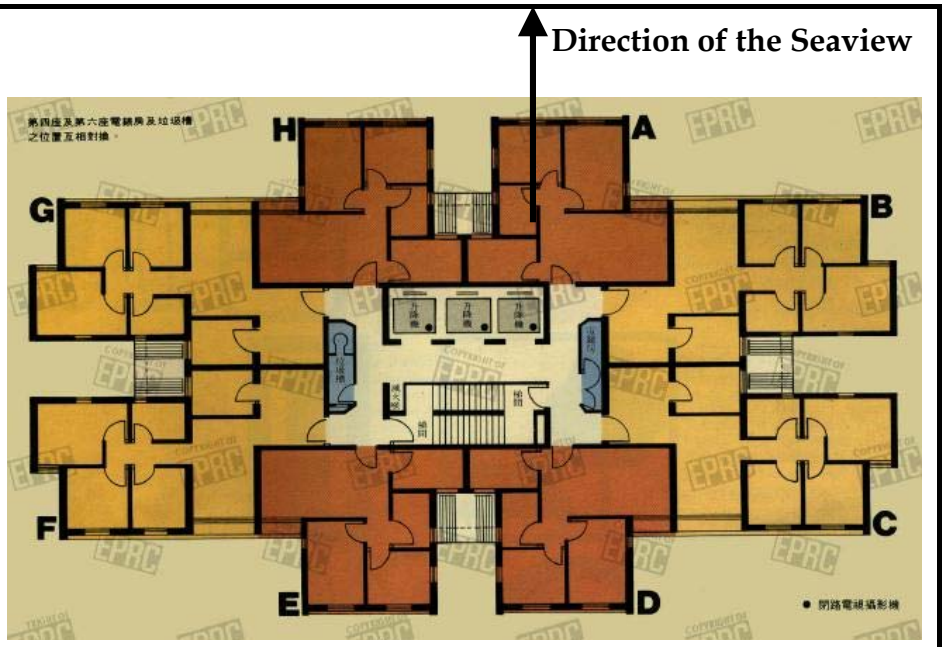
Therefore, two hypotheses are reformulated in light of Area Ratio.

Hypothesis 1 is rewritten as *Area Ratio is higher in a seaside building than that in a building not facing the sea.*

And Hypothesis 2 is restated as *the better quality the sea views, the greater the Area Ratios*.

Figure.3-2: Illustration of Area Ratio Calculation

(Floor plan from Tower 1, Chi Fu Fa Yuen, ***Source: Economic Property Research Centre*****)**



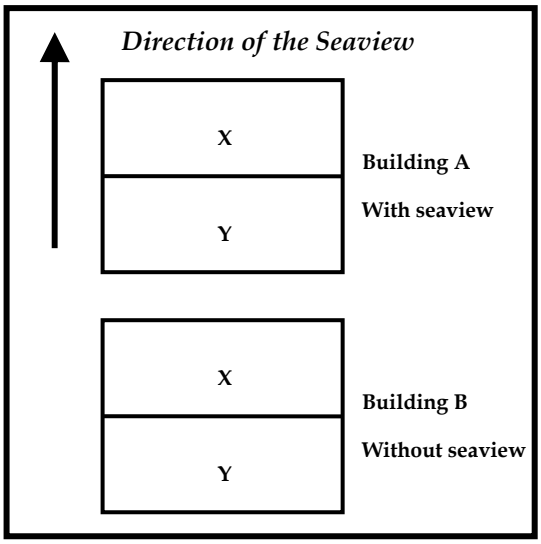
Calculation of Area Ratio

Area Ratio (AR) = sum of GFA of Flats facing seaward / Total GFA x 100%

= (GFA of Flat A + GFA of Flat B + GFA of Flat G + GFA of Flat H)x 100% /

(GFA of Flat A+ GFA of Flat B + GFA of Flat C + GFA of Flat D +GFA of Flat E + GFA of Flat F + GFA of Flat G + GFA of Flat H)

Figure.3-3: Area Ratios of Buildings with sea views and Buildings without sea views



Area Ratio

AR of Building A = Xx 100% /(X+Y)

(with a seaview)

AR of Building B = X x100%/ (X+Y)

(without a seaview)

3.3 Area of Study

The empirical study is conducted on private estate developments by the seaside in Hong Kong and Kowloon. Instead of using single building blocks, estate type developments (three blocks or above) are chosen to be investigated in order to reduce variability of the neighborhood. Also, the effects of individual site constraints in single block type may be overwhelming and difficult to control. The study excludes any HOS and PSPS developments because the standard layout plans are likely to be adopted, which may blind the effects of sea views. Furthermore, since the second part of the hypothesis testing considers the effect of quality of views, it is important to encompass buildings with different types of views in the study. With reference to the Landscape Characters Mapping (Planning Department 2003), the author identified and included five types of the water landscapes including Inshore

Water landscape, Typhoon Shelter Landscape, Victoria harbour, and Rambler Channel. The last two are originally classified as the same category of 'Strait Water Landscape' but the author takes notice of the reputation of Victoria harbour for being a spectacular waterfront and constituting a panoramic, firework scenery at festive occasions. It is much different from the sceneries of Rambler Channel in Tsuen Wan, where lumping of cargoes is found at nearby terminals. Therefore, the sew views are sub-classified into two types. The respective characteristics are summarized in Table.3-1 and the location of area is indicated by Landscape Characters Map in Figure.3-4.

Table.3-1: Characteristics of Different Types of Sea views

Types classified in Landscape Characters Map & Descriptions (Source: Planning Department 2003)	**Types adopted in the study**	**Areas included in the study**
Strait Landscape These are areas of inshore water enclosed by landform on two sides creating a sense of enclosure on two sides. They are characterised by shorelines that are more or less parallel with a distinct sense of enclosure on two sides. These landscapes consist predominantly of water, but may also include small, isolated islands (less than 500m wide), vessels, fish farms and marine activities of all kinds, including anchorages, commercial shipping lanes, ferry traffic and waterborne recreational activity. It is the combination of their enclosure, the character of the shoreline, and marine activities which give these landscapes their character, e.g. Inner Victoria Harbour, Tolo Channel, etc	1. Victoria harbour 2. Rambler Channel	Victoria Harbour Rambler Channel

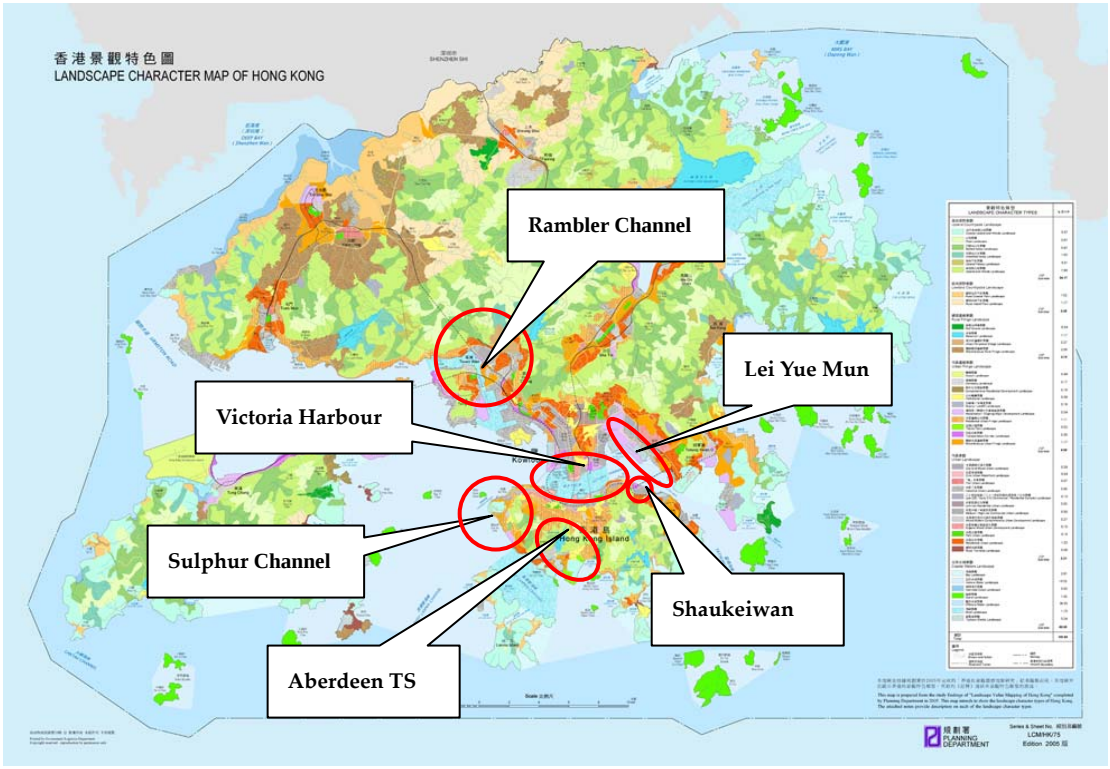
Table.3-1: Characteristics of Different Types of Sea views (Cont'd)

Types classified in Landscape Characters Map & Descriptions (Source: Planning Department 2003)	**Types adopted in the study**	**Areas included in the study**
Inshore Water Landscape These are areas of water enclosed to a certain degree by land (landmass or islands), creating a limited sense of enclosure. These landscapes consist predominantly of water, but may also include small, isolated islands (less than 500m wide), vessels, fish farms and marine activities of all kinds, including anchorages, commercial shipping lanes, ferry traffic and waterborne recreational activity. It is the combination of their enclosure, adjoining landforms, marine activities and any small islands which give these landscapes their character, e.g. Port Shelter and Ninepin Islands Inshore Waters, etc.	3. Inshore Water Landscape	Lei Yue Mun and Sulphur Channel

Table.3-1: Characteristics of Different Types of Sea views (Cont'd)

Types classified in Landscape Characters Map & Descriptions (Source: Planning Department 2003)	**Types adopted in the study**	**Areas included in the study**
Typhoon Shelter Landscape These are inshore aquatic landscapes defined by the presence of a breakwater used to protect moored vessels. They are given a significant sense of enclosure by their surrounding armourstone breakwaters. Though they consist primarily of water, they also contain other significant features such as breakwaters, jetties and pontoons as well as moored boats (sampans, fishing vessels, leisure vessels, etc.), giving them a sense of transitional landscape between land and sea (e.g. Yau Ma Tei Typhoon Shelter, Causeway Bay Typhoon Shelter).	4. Typhoon Shelter Landscape	Aberdeen Typhoon Shelter and Shaukeiwan Typhoon Shelter

Figure.3-4: Landscape Characters Map of Hong Kong (*Source: Planning Department 2003*)



3.4 Model Specification

As we have seen earlier in section 3.1, there are two hypotheses regarding the presence of sea views and quality of sea views. According to the hypotheses testing is also divided into two parts. In part one, a paired t-test is used to examine the effect of sea views on area allocation of buildings in individual developments. In part two, a regression model is employed to incorporate different qualities of sea views. They are discussed in more detail in the following sections.

3.4.1 Part I. Paired t-test

Hypothesis 1 predicts that Area Ratio is higher in a seaside building than that

in a building not facing the sea. To this end, a paired t-test is used to test the increasing effect of sea views on area ratios. Paired t-test is preferable to common t-test considering the observed data, and possible biases should be excluded in Area Ratios to produce valid results. Building considerations may vary from one development to another; possible factors such as site constraints and architectural designs may influence Area Ratio. Therefore, except for the presence of a sea view, it is essential to hold other factors constant in the sample buildings to conduct a valid comparison.

Different from normal t-tests, the comparison made in paired t-test is between a pair of homogenous individuals, in which other than that of testing factor, effects of possibly influential factors are eliminated. In this sense, two buildings are chosen for every development: one with the seaview and the other without. Their Area Ratios are then compared with each other. The same process is conducted on a large number of developments and the significance is tested by t-test accordingly. The statistical model used is outlined as follows:

The statistical model is given by

$$y_i = \mu_i + \varepsilon_i \qquad i= 1: \text{presence of seaview; } 2:\text{absence of seaview} \qquad (3\text{-}1)$$

where:

y_i *is the area-ratio of building in a development in the effect of seaview i;*

μ_i *is the effect of sea views i; and*

ε_i *is the experimental error.*

A comparison of area ratios is conducted by inspecting the individual

differences on a specific development.

$$d = y_1 - y_2 \qquad (3\text{-}2)$$

It is derived that:

$$\mu_d = \mu_1 - \mu_2.$$

Testing null hypothesis $H_0: \mu_d = 0$, the paired t-test for n samples of developments is applied as,

$$t_n = \frac{\bar{d}}{s_d}\sqrt{n} \quad \text{with} \quad s^2_d = \frac{\sum_{i=1}^{n}(d_i - \bar{d})^2}{n-1} \qquad (3\text{-}3)$$

where $\bar{d}$ and s_d are mean of the difference between area ratios and standard deviation of area ratios respectively, whereas n is the number of samples. t_n is expected to be significantly positive to reject the null hypothesis, confirming the effect of sea views on area ratios.

3.4.2 Part II. Regression model

Hypothesis 2 predicts that the better the quality of sea views, the greater the Area Ratios. A regression model is devised to test the mentioned relationship and is specified in a linear form. It is given by (5-4).

$$AR = b_0 + b_1 FULL + b_2 VICTORIA + b_3 RAMBLER + b_4 TYPHOON + b_5 AREA + b_6 BLOCK \qquad (3\text{-}4)$$

where b_0 is a constant term, and b_i are the i^{th} coefficients to be estimated (i=1,…,6). AR is the Area Ratio, which is defined in section 3.2. AREA is lot area of a development in square meters. BLOCK is the number of blocks of a development. FULL is a dummy variable that equals 1 if it is a full view, and 0 for a partial view. VICTORIA is a dummy variable that equals 1 if the

seaview is classified as Victoria Harbour and equals to 0 otherwise. RAMBLER denotes another dummy variable which take the value of 1 if the seaview is classified as Rambler Channel and 0 otherwise. Similarly, TYPHOON is a dummy variable that equals 1 if the seaview is classified as Typhoon Shelter Landscapes and equals to 0 otherwise. The meanings of these variables are further explained in the following.

AREA and BLOCK are independent variables used to control for the characteristics of developments. AREA reflects the site constraint of the size. BLOCK, on the other hand, reflects the scale of development.

This model aims to inspect whether or not Area Ratios are affected by the quality of sea views, which in turn is defined by the extent and type of view.

The effect of the extent of view is reflected by the dummy variable, FULL. Sea views in this study are classified into two types: full view and partial view. The former is defined as having an angle of view approximately equal to 180 degrees, and the latter is defined as having an angle of view less than 180 degrees (in this case, flats may be rebated or blocked by obstacles).

For the effect of type of view, four types of sea views are classified according to the location as indicated previously in Figure.3-4 in Section 3.3 of this Chapter. Three dummy variables are added to inspect this effect. They are VICTORIA, RAMBLER, and TYPHOON. VICTORIA means Victoria Harbour; RAMBLER stands for Rambler Channel; and TYPHOON means Typhoon Shelter Landscapes.

The coefficients b_0, and b_i are estimated by the Ordinary Least Square method.

The signs of coefficients of AREA and BLOCK are indeterminate.

The coefficient of FULL is expected to be positive and significant. Research in property (Section 3.3) suggests a wider view calls for a higher premium than a narrower one, showing that the value of a wider view is higher (e.g. Benson et al 1998; Bourassa et al 2003). Wider views are expected to be of higher quality, and also associated with higher Area Ratios.

The signs of coefficients of VICTORIA, RAMBLER and TYPHOON are all expected to be positive. Since the changes in area a ratio are hypothesized to correspond to the differences in quality of views, type of views—being the proxies of quality—is expected to have a significant effect on the area ratios. Moreover, it is also expected that the coefficient of VICTORIA would be the highest among all, because of people's desire for its firework scenery.

If Hypothesis 2 is correct, at least one of the dummy variables, FULL, VICTORIA, RAMBLER, or TYPHOON, should be significant and positive.

Table.3-2: Summary of the Expected Signs of Coefficients of Regression Model

Independent variables	Coefficients	Expected signs
FULL	b_1	+
VICTORIA	b_2	+
RAMBLER	b_3	+
TYPHOON	b_4	+
AREA	b_5	?
BLOCK	b_6	?

3.5 Data

In general, data regarding the developments are collected from property data engine powered by Economic Property Research Centre (EPRC). It consists of a database containing past transaction records, basic development information, and floor plans. Information about the number of blocks and floorplans is obtained, and the GFAs of individual flats are retrieved from past transaction records. Sea view information is obtained from map reading, and also researcher's judgment with the aid of Google satellite/aerial photos. Lot area information is obtained from the e-statutory plan from Outline Zone Plan website. By using floorplans, data of GFAs, as well as sea view information, Area Ratios of the buildings are calculated accordingly to description in Section 3.2.

In Part I of the Paired t-test, 34 buildings from 17 estate developments (two buildings each development) are included and the data is listed in Table. 3-4.

These seaside developments are selected from the study areas (Victoria Harbour, Rambler Channel, Lei Yue Mun, Sulphur Channel, Aberdeen Typhoon Shelter and Shaukeiwan Typhoon Shelter) mentioned in Section 3.3. The developments included in the sample must meet two requirements. First, the development should consist of one building with the seaview and one with none. It is a very restrictive requirement because in seaside developments, the buildings usually enjoy at least some degrees of sea views, buildings with no seaview at all are rare. Second, the sea views should be unilateral, so that Area Ratios of the buildings can be calculated as defined in Section 3.2. Also, sometimes buildings adopt different floorplans for different floor levels. In that case, the plan utilized by the most numbers of floor levels is used to calculate AR. Lastly, due to practical concerns of small sample size, it should be noted that the type of sea views are not controlled in this test. Therefore, 17 buildings pairs are obtained in total.

Table.3-3: Sample of Part I. Paired t-test

Development Name	District	Type of Sea faced#	AR of building without sea views (%)	AR of building with sea views (%)
Aberdeen Centre	Aberdeen	T	69.26	100
Baguio Villa	Pokfulam	I	59.84	100
Chi Fu Fa Yuen	Pokfulam	I	50	50
Tai Koo Shing	Taikoo	I	50	53.12
Heng Fa Chuen	Heng Fa Chuen	I	51.85	55.67
Laguna City	Lam Tin	I	50	100
Wei Chien court	To Kwa Wan	I	47.87	74.04
Provident Centre	North Point	V	38.85	1
Laguna Verde Costa Del Sol	Hung Hom	V	49.54	60.67
Whampoa Garden Ph 7	Hung Hom	V	50	53.69
Whampoa Garden Ph 9	Hung Hom	V	50	65.1507
Greeenfield Garden	Tsuen Wan	R	51.47	49.86
Grand Horizon	Tsuen Wan	R	49.86	51.47
Tierra Verde	Tsuen Wan	R	50.68	48.60
Riviera Garden	Tsuen Wan	R	43.43	52.95
Serenade Cove	Tsuen Wan	R	55.37	55.02
Belvedere Garden Ph1	Tsuen Wan	R	47.39	57.10
Belvedere Garden Ph2	Tsuen Wan	R	50	50

 # V: Victoria Harbour; R: Rambler Channel; T: Typhoon Shelter Landscape; and I: Inshore Water Landscape

In Part II of the Regression model, unlike Part I, the sample is extended to incorporate developments in which all buildings enjoy sea views. Nevertheless, regarding the lot area, the information obtained from e-statutory plan shows the area of an entire lot. Therefore, for developments sharing the same lot with others, their lot area cannot be separated and for this reason they are excluded in the sample. As a result, some developments in Part I are not included in Part II. Again, only buildings with one side of sea view are included to preserve the validity of ARs. Some developments such as Taikoo Shing, have more than ten buildings facing the sea with the same floor plan. To avoid the overwhelming effect of a particular development, at most two buildings of the same plan are included. 57 buildings of 15 estate developments are included in Part II of the Regression model and a summary of them is given in Table.3-4. Table.3-5 presents the descriptive statistics of the data in Part I and Part II.

Table.3-4: Sample of Part II. Regression Model

Development	District	Sea faced#	No. of Plans collected (Full view/partial view)
Heng Fa Chuen	Heung Fa Chuen	I	10 (6/4)
Lei King Wan	Quarry Bay	I	4 (2/2)
Tai Koo Shing	Taikoo	I	2 (2/0)
Laguna Verde Costa Del Sol	Hung Hom	V	4 (3/1)
Whampoa Garden	Hung Hom	V	6 (2/4)
City Garden	North Point	V	5 (3/2)
Provident Centre	North Point	V	4 (2/2)
Rivera Gardens	Tsing Yi	R	4 (3/1)
Bayview Garden	Tsuen Wan	R	2 (2/0)
Belvedere Garden	Tsuen Wan	R	4 (2/2)
Tierra Verde	Tsing Yi	R	4 (0/4)
Marina Habitat	Aberdeen	T	2 (2/0)
Sham Wan Towers	Aberdeen	T	2 (0/2)
Grand Promenade	Quarry Bay	T	2 (2/0)
Les Saisons	Shau Kei Wan	T	2 (2/0)
		Total	57 (34/23)
		I	16 (10/6)
		V	19 (8/7)
		R	14 (7/7)
		T	8 (6/2)

 # V: Victoria Harbour; R: Rambler Channel; T: Typhoon Shelter Landscapes; and I: Inshore Water Landscapes

Table.3-5: Descriptive Statistics of Developments in Part I and Part II

	Mean	Standard deviation	Minimum	Maximum
I. Paired t-test				
Age (year)	19.12	7.32	6.00	28.00
Block	31.73	25.91	3.00	88.00
II. Regression Model				
Age (year)	16.89	6.84	2.00	27.00
Block	29.30	25.58	3.00	88.00

Chapter Four

Empirical Results

This chapter presents the statistical results derived from two parts, Paired t-test and Regression Model specified in Methodology (Chapter 3). It begins with the summary statistics of the data, which are followed by the paired t-test result to examine whether the presence of sea views is a determining factor on area ratio. Next, the Regression Model is used to test how the area ratio changes with different qualities of views. In each part, the empirical results are presented and followed by discussion of the results.

4.1 Summary Statistics

This section shows the summary statistics. The descriptive statistics of Area Ratios of the buildings in the Paired t-test is given in Table.4-1. The descriptive statistics of Area Ratios and views quality mix in Regression Model is shown in Table.4-2.

Table.4-1.: Descriptive Statistics of the Area Ratios of Part I. Paired t-test

	Mean	Standard deviation	Minimum	Maximum
Area Ratio of buildings without sea views (%)	50.82	20.21	38.86	69.26
Area ratio of buildings with sea views (%)	66.33	6.46	48.60	100.00
Area Ratio of buildings without and with sea views (%)	65.37	21.39	38.86	100.00

Table.4-2: Descriptive Statistics of Area Ratios and Views Quality Mix of Buildings in Part II. Regression Model

	Mean	Standard deviation	Minimum	Maximum
Area Ratio (%)	56.87	6.79	49.67	79.89
FULL	0.56	0.50	0.00	1.00
VICTORIA	0.33	0.48	0.00	1.00
RAMBLER	0.25	0.43	0.00	1.00
TYPHOON	0.14	0.35	0.00	1.00
AREA (m^2)	78202.18	78997.96	6197.00	203368.00
BLOCK	29.30	25.58	3.00	88.00

4.2 Empirical Results of Part I. Paired t-test

The result of the Paired t-test is reported in Table.4-3.

Table.4-3: Statistical Result of Part I. Paired t-test

	Area ratio of buildings without sea views (%)	**Area Ratio of buildings with sea views (%)**
Mean	50.8202049	66.3262185
Variance	0.004174554	0.040851689
Observations	17	17
Pearson Correlation	0.29315554	
Hypothesized Mean Difference	0	
Df	16	
t Stat	-3.307237382	
P(T<=t) one-tail	0.002225459	
t Critical one-tail	1.745883669	
P(T<=t) two-tail	0.004450918	
t Critical two-tail	2.119905285	

The p value shown is less than 5%, suggesting that the null hypothesis is rejected. This indicates the presence of sea views has a significant effect on area ratios. In fact, building facing a seaview has a larger floor area allocated to the flats with that view.

4.3 Empirical Results of Part II. Regression Model

The Regression Model was estimated by the Ordinary Least Square method. The equation of the model is replicated as in Section 3.4.2.

$$AR = b_0 + b_1 FULL + b_2 VICTORIA + b_3 RAMBLER + b_4 TYPHOON + b_5 AREA + b_6 BLOCK \quad (3\text{-}4)$$

where b_0 is a constant term, and b_i are the i^{th} coefficients to be estimated (i=1,…,6). AR is the Area Ratio as defined in section 3.2. AREA is lot area of a development in square meters. BLOCK is the number of blocks of a development. FULL is a dummy variable that equals 1 if it is a full view and equals 0 if it is a partial view. VICTORIA is a dummy variable that equals 1 if the seaview is classified as Victoria Harbour and equals to 0 otherwise. RAMBLER denotes another dummy variable which equals 1 if the seaview is classified as Rambler Channel and equals to 0 otherwise. Similarly, TYPHOON is a dummy variable that equals 1 if the seaview is classified as Typhoon Shelter Landscapes and equals to 0 otherwise.

The statistical results are listed in Table.4-4 below.

Table.4-4: Statistical Results of Part II. Regression Model

Variable	Coefficient	t-Statistic	p-value
FULL	5.581233	3.409633	*0.0013
VICTORIA	5.839181	2.746149	*0.0384
RAMBLER	0.661546	0.249193	0.8042
TYPHOON	6.632244	2.090042	*0.0417
AREA	3.90E-05	1.474069	0.1467
BLOCK	-0.094621	-1.206252	0.2334
Constant	50.42682	18.65498	*0.0000
R-squared	0.304505	F-statistic	3.648536
Adjusted R-squared	0.221045	Prob(F-statistic)	0.004422
No. of Observations	57		

**significant at the level of 5%*

The coefficients of AREA and BLOCK were insignificant at the 5% level. It suggests that neither lot area nor number of blocks have significant effects on the area ratios. It is possible that in the case of estate-type developments, the effect of site area on the design of individual buildings is minor. Developers decide the Area Ratios of the buildings regardless of the scale of developments.

The coefficient of FULL was positive as expected and statistically significant at the level of 5%, indicating that the extent of view has a significant effect on Area Ratios. It is consistent with the general belief that the wider view the better, and hence the larger the area allocated to the flats with these views.

On average, 5.58% more area is allocated to flats with full views than those with partial views.

Also, the coefficients of VICTORIA and TYPHOON were positive as expected and statistically significant at the level of 5%. It is interesting to note that typhoon shelter landscapes even have a greater effect on Area Ratios than Victoria harbour. When compared to buildings with the view of Inshore Water Landscape, 6.63% more area is allocated to flats with views of typhoon shelters while 5.84% more area is allocated to those with views of Victoria harbour. This suggests both types of views are better than the view of inshore water landscapes, and that the view of typhoon shelter may be better than those of Victoria harbour. People may favour special maritime features such as breakwaters, jetties and fishing vessels, all of which constitute a distinctive landscape. Also, the spectacular waterfront and firework scenery of the Victoria harbour is more desirable than the plain, water-dominant views like inshore water landscapes.

The coefficient of RAMBLER was insignificant at the level of 5%. It suggests that views of Rambler Channel do not have a significant influence on the Area Ratios, as compared with buildings with the views of inshore water landscapes. Although Rambler Channel is classified differently as Strait Water Landscapes in Landscape Characters Mapping (Planning Department 2003, Ref. to Section3.3 for details), the landscape consisting predominantly of water is similar to Inshore Water Landscapes, apart from the enclosure.

Since the dummy variables, FULL, VICTORIA and TYPHOON are positive

and significant; Hypothesis 2 that the Area Ratios increases with the quality of sea views is supported. Developers tend to allocate more area to flats with better views.

Chapter Five

Conclusion

This closing chapter embraces a summary of the contributions, limitations, and recommendations for future research.

5.1 Summary of Contributions

As described in Section 2.2, the relative price theory expounded by Alchian and Allen predicts that an imposition of fixed cost entails a change in the relative prices of goods of different qualities, and that a larger fraction of high-quality good is thus consumed. The theory provides a novel perspective on the law of demand, extending its predictive power from between different commodities, to within a commodity, making elucidations for more real-world observations. Notwithstanding controversial conditions, its significance is without question and it is sometimes regarded as the third of demand.

Studies involving the relative price theory studies have focused on transportation costs and taxation policies. This dissertation has courageously applied it to building design of seaside properties. The theory is used to explain more area allocation to flats with better views in seaside developments, and the empirical results are remarkably in accordance with the predictions of the theory.

We conducted analyses on 84 buildings from 23 different seaside

developments in Hong Kong. In one of the experimental parts in Chapter 4, the Paired t-test confirmed that sea views do have a significant effect on area allocation to flats with those views. Such findings imply that in designing building layout of seaside developments, developers are likely to allocate larger areas to flats with sea views.

Another experimental part of the same chapter further investigated the effect of the quality of sea views on area allocation with a regression model. The results correspond to the prediction that the better the quality of the views, the larger the area allocated to the flats. This finding shows that area allocation depends on the quality of the views in such a way that more area is allocated to flats with higher-quality views than to those with lower-quality views.

All in all, this dissertation has made an initial attempt to testify the relative price theory in the contexts of seaside properties. Despite some unknown factors ascribed to area allocation, the present study has made some contributions in this novel area of research. Future studies could incorporate other variables and include more comprehensive analysis of property developments in Hong Kong.

5.2 Limitations

Several limitations in this dissertation deserve attention.

First and foremost, the quality classes of the buildings sample in the study are not controlled. Although estate-type developments are used, the variability

due to different qualities of buildings may lead to different building designs, which in turn may overshadow the effects of sea views. Other building constraints are also not taken into consideration. For example, height of the building could be controlled because it may have an enhancing effect on sea views.

It is noted that although efforts are made to selectively include the estate-type development, immediate surroundings such as landscaping and appearance of buildings are not addressed in the model, which may also be influential as suggested by Bourassa et al (2003). Such possible effects may be significant especially in recent developments with more amenities and aesthetics feature such as parks.

One final point concerns the assumption on which the hypotheses based. The study regards land premium due to sea views as the fixed cost imposed on all flats irrespective of quality. This is deduced logically from observations. Yet I have to admit that no evidence is collected to confirm that the same amount of land cost is imposed on the flats with views and those without. As Razzolini et al (2003) underscored, the high-grade goods become cheaper relatively to the low-grade goods provided that the two prices rise by the same absolute amount, or if the price of the lower-grade goods rise proportionally more than that of the higher-grade. Therefore the assumption of fixed cost merits closer examinations. Since there is no better alternative available, the author has decided to adopt this assumption.

5.3 Recommendations for Further Research

Considering the limitations of the current study, future research could extend the sample base so that samples are tested within subgroups to address the variance of building age and quality. Moreover, GIS coordination may be utilized to better assess the proximity of building to water. Researchers could also keep the external factors equal by incorporating more control variables such as amenities and development density.

In the theoretical aspect, future studies should examine more closely on the fixed cost assumptions and to offer better alternatives.

Lastly, this study preliminarily examines the effect of desirable views on area allocation. Further research may explore the effects of negative landscapes including road views and cemetery views. Also, the effect of height on views can be tapped, such as changing area allocation on different floor levels.

References

Adams, W.J. and Yellen, J.L. (1976). Commodity Bundling and the Burden of Monopoly. *The Quarterly Journal of Economics*, Aug 1976, **90**(3), pp. 475-498.

Alchian, A.A. and Allen, W.R. (1972) *University Economics* (3rd Edn), Wadsworth. Belmont, California.

Austin, A.D. (1977). The Individual Coercion Doctrine in Tie-In Analysis: Confusing and Irrelevant. *California Law Review.* Dec. 65(6), pp. 1143-1180.

Bartik, T, J. (1988). Measuring the Benefits of Amenity Improvements in Hedonic Price Models. *Land Economics*, May1988, **64**(2), pp. 172-183.]

Barzel, Y. (1976). An Alternative Approach to the Analysis of Taxation. *The Journal of Political Economy*, Dec 1976, **84**(6), pp. 1177-1197.

Barzel, Y. (1982). Measurement Cost and the Organization of Markets. *Journal of Law and Economics*, Apr1982, **25**(1), pp. 27-48.

Bauman, Y. (2004). "Shipping the Good Apples Out: A New Perspective," *Economic Inquiry*, July, **42**(3), p. 534-536.

Benson, E.D., Hansen, J.L., Schwartz, Jr, A.L. and Smersh, G.T. (1998). Pricing Residential Amenities: The Value of a View. J*ournal of Real Estate Finance and Economics*, **16**(1), pp. 55-173.

Bertonazzi, E.P., Maloney, M.Y. and McCormick, R.E. (1993). Some evidence on the Alchian and Allen theorem: The third law of demand? *Economic Inquiry.* Jul. **31**(3), pp. 383.

Bertrud, A. (1997). *Measuring Constraints on Land Supply- The case of Hong Kong* [online]. Available from www.alain-bertrud.com/images/HK_outline4.pdf [accessed on 23 March 2007

Bond, M. T., Seiler V. L. and Seiler M. J. (2002). Residential Real Estate Prices: A Room with a View. *Journal of Real Estate Research*. **23**(1/2), pp. 129-37.

Borcherding, T, E. and Silberberg, E. (1980). Shipping the Good Apples Out: The Alchian and Allen Theorem Reconsidered. *The Journal of Political Economy*, Feb, **88**(1), pp. 209.

Bourassa, S. C., Hoesli, M. and Jian, S. (2003). What's in a view? *FAME Research Paper Series* rp 79, International Center for Financial Asset Management and Engineering.

Bowman, Jr. W.S. (1957). Tying Arrangements and the Leverage Problem. *The Yale Law Journal*, Nov 1957, **67**(1), pp.19-36.

Boyle, M. and Kiel, K. A Survey of House Price Hedonic Studies of the Impact of Environmental Externalities, Journal of Real Estate Literature, **9**(2), pp. 116-144.

Brown, Jr, G.M. and Pollakowski, H.O. (1977). Economic Valuation of Shoreline. *The Review of Economics and Statistics*, Aug 1977, **59**(3), pp. 272-278.

Burstein, M. L. (1960). The Economics of Tie-In Sales. *The Review of Economics and Statistics*. Feb 1960, **42**(1), pp. 68-73.

Carbajo, J., Meza, D., and Seidmann, D.J. (1990). A Strategic Motivation for Commodity Bundling. *The Journal of Industrial Economics*, Mar 1990, **38**(3), pp. 283-298.

Carlton, D.W. and Waldman, M. (2002). The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries. *The RAND Journal of Economics*, Summer 2002. **33**(2), pp. 194-220.

Centamap 2007. Available from http://www.centamap.com [accessed on 1 January 2007]

Cheung, S.N.S. 2006. *Economic Explanation Book II, The Behavior of Supply.* 2nd Edn. pp.269-295. Hong Kong: Arcadia Press

Choi, J.P. and Stefanadis, C. (2001). Tying, Investment, and the Dynamic Leverage Theory. *The RAND Journal of Economics*, Spring 2001, **32**(1), pp. 52-71.

Colwell, P.F. and Dehring, C.A. (2005). The Pricing of Lake Lots. *Journal of Real Estate Finance and Economics.* May, **30**(3), pp. 267

Darling, A. H. (1973). Measuring Benefits Generated by Urban Water Parks. *Land Economics*, Feb, **49**, pp.22-34.

Eli, L. (2005). 500 flats at The Arch sold in less than 12 hours. *The Standard*. 18 April.

Feenstra, R.C. (1988). Quality Change Under Trade Restraints in Japanese Autos. *The Quarterly Journal of Economics*, Feb 1988, **103**(1), pp. 131-146.

Ferguson, J. M. (1965). Tying Arrangements and Reciprocity: An Economic Analysis. *Law and Contemporary Problems*, The Antitrust Laws and Single-Firm Conduct. Summer, 1965, **30**(3), pp. 552-580.

Freeman, III, A.M. (1979). Hedonic Prices, Property Values and Measuring Environmental Benefits: A Survey of the Issues. *The Scandinavian Journal of Economics*, Measurement in Public Choice, **81**(2), pp. 154-173.

Fung, B.C.K. (2001). *Planning for High-density development in Hong Kong*. Cities Summit 2001, Singapore August 2001. [online]. Available from: www.pland.gov.hk/press/speeches/highden_dev.pdf [accessed 23 March 2007]

Gould, J.P and Segall, J. (1969). The Substitution Effects of Transportation Costs. *The Journal of Political Economy*, Jan - Feb 1969, **77**(1), pp. 130-137.

Hansen, R.S. and Roberts, R.B. (1980). Metered Tying Arrangements, Allocative Efficiency, and Price Discrimination. *Southern Economic Journal*, Jul 1980, **47**(1), pp. 73-83.

Jeuland, A. (1984). Comments on "Gaussian Demand and Commodity Bundling" Part 2: Pricing Strategy. *The Journal of Business.* Jan. **57**(1), pp. S231-S234

Johnson, T.R. (1978). Additional Evidence on the Effects of Alternative Taxes on Cigarette Prices. *The Journal of Political Economy*, Part 1, Apr, **86**(2), pp. 325-328

Klein, B. (2001). The Microsoft Case: What Can a Dominant Firm Do to Defend Its Market Position? (in Symposium: The Microsoft Case). *The Journal of Economic Perspectives*, Spring 2001, **15**(2), pp. 45-62.

Legco (2006). *Land Supply in Hong Kong* [online]. Available from http://legco.gov.hk/yr05-06/english/sec/library/0506in20e.pdf. [accessed on 23 March 2007]

Mathewson, F. and Winter, R. (1997). Tying as a Response to Demand Uncertainty. *The RAND Journal of Economics*, Autumn 1997, **28**(3), pp. 566-583.

Markovits, R.S. (1967). Tie-ins, Reciprocity, and the Leverage Theory. *The Yale Law Journal*, Jun 1967, **76**(7), pp. 1397-1472..

Markovits, R.S. (1970). Tie-ins, Reciprocity, and the Leverage Theory. Part II: Tie-ins, Leverage, and the American Antitrust Laws. *The Yale Law Journal*, Dec 1970, **80**(2). pp. 195-315.

McAfee, R.P., McMillan, J. and Whinston, M.D. (1989). Multiproduct Monopoly, Commodity Bundling, and Correlation of Values (in Short Papers). *The Quarterly Journal of Economics*, May 1989, **104**(2), pp. 371-383.

Nelson, A.C., Genereux, J. and Genereux, M. (1992). Price Effects of Landfills on House Values, Land Economics, **68**(4), pp. 359-365.

Nicholls, S. and Crompton, J.L. (2005). The Impact of Greenways on Property Values: Evidence from Austin, Texas. *Journal of Leisure Research*. Arlington: Third Quarter, **37**(3), pp. 321.

Ormiston, M.B. and Phillips, O.R. (1988). Nonlinear Price Schedules and Tied Products. *Economica*, New Series, May 1988, **55**(218), pp. 219-233.

Planning Department (2003). Landscape Value Mapping of Hong Kong [online]. Available from

Plattner, R. H. and T. J. Campbell. (1978). A Study of the Effect of Water View on Site Value. *Appraisal Journal,* Jan, **46**, pp.20-25.

Razzolini, L., Shughart II, W.F. and Tollison, R.D. (2003). On the third law of demand. *Economic Inquiry*. Apr. **41**(2), pp. 292

Ridker, R.G. and Henning, J.A. (1967).The Determinants of Residential Property Values with Special Reference to Air Pollution. *The Review of Economics and Statistics*, May 1967, **49**(2), pp. 246-257.

Rosen, S. (1974). Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. *The Journal of Political Economy,* Jan-Feb.1974, **82**(1), pp. 34-55.

Santoni, G.J. and Cott, T.N.V. (1980). Import Quotas: The Quality Adjustment Problem. *Southern Economic Journal*. Apr 1980, **46**(4), pp. 1206-1211.

Schmalensee, R. (1982).Commodity Bundling by Single-Product Monopolies. *Journal of Law and Economics*, Apr 1982, **25**(1), pp. 67-71.

Schmalensee, R. (1984). Gaussian Demand and Commodity Bundling. *The Journal of Business*. Part 2: Pricing Strategy, Jan, **57**(1), pp. S211-S230

Seidmann, D.J. (1991). Bundling as a Facilitating Device: A Reinterpretation of Leverage Theory. *Economica*, New Series, Nov1991, **58**(232), pp. 491-499.

Simons, R.A. and Saginor, J.D. (2006). A Meta-Analysis of the Effect of Environmental Contamination and Positive Amenties on Residential Real Estate Values. *The Journal of Real Estate Research*, Jan-Mar, **28**(1), pp.71-104.

Sito, P. (2005). Bad news for flat tenants. *South China Morning Post*. 16 March.

Sito, P. (2004). A few cautionary words for the eager buyer. South *China Morning Post*. 24 March.

Sobel, R.S. and Garrett, T.A. (1997). Taxation and Product Quality: New Evidence from Generic Cigarettes (in Confirmations and Contradictions). *The Journal of Political Economy*, Aug 1997, **105**(4), pp. 880-887.

South China Morning Post. 2006. Policy on location of public housing overdue. *South China Morning Post.* 22 May.

Staten, M. and Umbeck, J. (1989). Shipping the Good Students out: The Effect of a Fixed Charge on Student Enrollments (in Content Articles in Economics). *The Journal of Economic Education*, Spring 1989, **20**(2), pp.

165-171.

Stigler, G. J. (1963). United States v. Loew's Inc.: A Note on Block-Booking. *The Supreme Court Review*, **1963**, pp. 152-157

Sumner, M.T. and Ward, R. (1981). Tax Changes and Cigarette Prices. *The Journal of Political Economy*, Dec, **89**(6), pp. 1261-1265

Tse, R.Y.C. and Love, P.E.D. (2000). Measuring residential property values in Hong Kong. *Property Management.* Bradford: 2000. **18**(5), pp. 366.

Turner, D. F. (1958). The Validity of Tying Arrangements under the Antitrust Laws. *Harvard Law Review*, Nov 1958, **72**(1). pp. 50-75.

Umbeck, J. (1980). Shipping the Good Apples Out: Some Ambiguities in the Interpretation of "Fixed Charge" (in Comments). *The Journal of Political Economy*, Feb, **88**(1), pp. 199-208.

Wheeler, M.E. (1972). Some Observations on Tie-Ins, the Single-Product Defense, Exclusive Dealing and Regulated Industries. *California Law Review*, Nov, **60**(6), pp. 1557-1585.

Whinston, M.D. (1990). Tying, Foreclosure, and Exclusion. *The American Economic Review*, Sep 1990, **80**(4), pp. 837-859.

Whinston, M.D. (2001). Exclusivity and Tying in U.S. v. Microsoft: What We Know, and Don't Know (in Symposium: The Microsoft Case). *The Journal of Economic Perspectives*, Spring 2001, **15**(2), pp. 63-80.

Wollenberg, K. K. (1987). An Economic Analysis of Tie-In Sales: Re-Examining the Leverage Theory (in Notes). *Stanford Law Review*, Feb 1987, **39**(3), pp. 737-760.

Wolverton, M.L. (1997). Empirical study of the relationship between residential lot price, size and view. *Journal of Property Valuation and Investment.* Jan, **15**(1), pp. 48-57.

Wong, W.S. (2003). *The Effects of Building Regulations Control on the Design of Private Residential Buildings*. Ph. D. Thesis, The University of Hong Kong.

Wu, J., Adams, R.M. and Plantinga, A.J. (2004). Amenties in an Urban Equilibrium Model: Residential Development in Portland, Oregon. *Land Economics*, Feb, **80**(1), pp. 19-32.

Appendix I Data of Part I. Paired t-test

DISTRICT	DEVELOPMENT	BLOCK	VICTORIA	RAMBLER	TYPHOON	INSHORE	VIEW	RATIO
Aberdeen	Aberdeen Centre	T	0	0	1	0	1	100.00%
Aberdeen	Aberdeen Centre	A	0	0	1	0	0	69.26%
Pok Fu Lam	Baguio Villa	16	0	0	0	1	1	100.00%
Pok Fu Lam	Baguio Villa	22	0	0	0	1	0	59.84%
Pok Fu Lam	Chi Fu Fa Yuen	4	0	0	0	1	1	50.00%
Pok Fu Lam	Chi Fu Fa Yuen	6	0	0	0	1	0	50.00%
North Point	Provident Centre	6	0	0	0	1	1	100.00%
North Point	Provident Centre	5	0	0	0	1	0	38.86%
Quarry Bay	Tai Koo Shing	33	0	0	0	1	1	53.12%
Quarry Bay	Tai Koo Shing	32	0	0	0	1	0	50.00%
Quarry Bay	Heng Fa Chuen	41	0	0	0	1	1	55.67%
Quarry Bay	Heng Fa Chuen	39	0	0	0	1	0	51.85%
Lam Tin	Laguna City	23	0	0	0	1	1	100.00%
Lam Tin	Laguna City	18	0	0	0	1	0	50.00%
To Kwa Wan	Wei Chien court	D	0	0	0	1	1	74.07%
To Kwa Wan	Wei Chien court	C	0	0	0	1	0	47.87%
Hung Hom	Laguna Verde Costa Del Sol	12A	1	0	0	0	1	60.67%
Hung Hom	Laguna Verde Costa Del Sol	11	1	0	0	0	0	49.54%
Hung Hom	Whampoa Garden (ph9)	9	1	0	0	0	1	53.69%
Hung Hom	Whampoa Garden (ph9)	3	1	0	0	0	0	50.00%
Hung Hom	Whampoa Garden (ph7)	5	1	0	0	0	1	65.17%
Hung Hom	Whampoa Garden (ph7)	4	1	0	0	0	0	50.00%

Data of Part I. Paired t-test (Cont'd)

DISTRICT	DEVELOPMENT	BLOCK	VICTORIA	RAMBLER	TYPHOON	INSHORE	VIEW	RATIO
Tsing Yi	Greeenfield Garden	10	0	1	0	0	1	51.47%
Tsing Yi	Greeenfield Garden	7	0	1	0	0	0	49.86%
Tsuen Wan	Grand Horizon	3	0	1	0	0	1	48.60%
Tsuen Wan	Grand Horizon	2	0	1	0	0	0	50.68%
Tsuen Wan	Tierra Verde	12	0	1	0	0	1	52.95%
Tsuen Wan	Tierra Verde	7	0	1	0	0	0	43.43%
Tsuen Wan	Riviera Garden	3	0	1	0	0	1	55.02%
Tsuen Wan	Riviera Garden	18	0	1	0	0	0	55.36%
Tsuen Wan	Serenade Cove	A	0	1	0	0	1	57.10%
Tsuen Wan	Serenade Cove	C	0	1	0	0	0	47.39%
Tsuen Wan	Belvedere Garden ph1	2	0	1	0	0	1	50.00%
Tsuen Wan	Belvedere Garden ph1	8	0	1	0	0	0	50.00%

Appendix II Data of Part II. Regression Model

DISTRICT	DEVELOPMENT	NO. OF BLOCK	AREA	BLOCK	VICTORIA	RAMBLER	TYPHOON	INSHORE	VIEW	RATIO
Heung Fa Chuen	Heng Fa Chuen	47	203368	27	0	0	0	1	1	65.46%
Heung Fa Chuen	Heng Fa Chuen	47	203368	29	0	0	0	1	1	65.46%
Heung Fa Chuen	Heng Fa Chuen	47	203368	46	0	0	0	1	1	55.37%
Heung Fa Chuen	Heng Fa Chuen	47	203368	47	0	0	0	1	1	55.37%
Heung Fa Chuen	Heng Fa Chuen	47	203368	40	0	0	0	1	1	55.67%
Heung Fa Chuen	Heng Fa Chuen	47	203368	41	0	0	0	1	1	55.67%
Heung Fa Chuen	Heng Fa Chuen	47	203368	43	0	0	0	1	0	55.67%
Heung Fa Chuen	Heng Fa Chuen	47	203368	45	0	0	0	1	0	55.67%
Heung Fa Chuen	Heng Fa Chuen	47	203368	11	0	0	0	1	0	50.00%
Heung Fa Chuen	Heng Fa Chuen	47	203368	19	0	0	0	1	0	52.99%
Quarry Bay	Lei King Wan	17	14490	1-8	0	0	1	0	1	56.98%
Quarry Bay	Lei King Wan	17	14490	1-8	0	0	1	0	1	56.98%
Quarry Bay	Lei King Wan	17	14490	1	0	0	1	0	0	52.40%
Quarry Bay	Lei King Wan	17	14490	2	0	0	1	0	0	52.40%
Taikoo	Tai Koo Shing	61	136725	33	0	0	0	1	1	53.12%
Taikoo	Tai Koo Shing	61	136725	43	0	0	0	1	1	53.12%
Hung Hom	Laguna Verde	25	42598	9	1	0	0	0	0	49.67%
Hung Hom	Laguna Verde	25	42598	8	1	0	0	0	1	53.18%
Hung Hom	Laguna Verde Costa Del Sol	25	42598	12A	1	0	0	0	1	60.67%
Hung Hom	Laguna Verde Costa Del Sol	25	42598	15A	1	0	0	0	1	60.67%

Data of Part II. Regression Model (Cont'd)

DISTRICT	DEVELOPMENT	NO. OF BLOCK	AREA	BLOCK	VICTORIA	RAMBLER	TYPHOON	INSHORE	VIEW	RATIO
Hung Hom	Whampoa Garden ph 9	88	186151	6	1	0	0	0	0	53.69%
Hung Hom	Whampoa Garden ph 9	88	186151	7	1	0	0	0	0	53.69%
Hung Hom	WhampoaGarden ph 10	88	186151	1	1	0	0	0	0	55.44%
Hung Hom	WhampoaGarden ph 10	88	186151	2	1	0	0	0	0	55.44%
Hung Hom	WhampoaGarden ph 7	88	186151	2	1	0	0	0	1	65.17%
Hung Hom	WhampoaGarden ph 7	88	186151	3	1	0	0	0	1	65.17%
North Point	City Garden	14	17930	4	1	0	0	0	0	50.04%
North Point	City Garden	14	17930	5	1	0	0	0	0	50.04%
North Point	City Garden	14	17930	1	1	0	0	0	0	50.00%
North Point	City Garden	14	17930	7	1	0	0	0	1	50.93%
North Point	City Garden	14	17930	8	1	0	0	0	1	50.93%
North Point	Provident Centre	17	20932	3	1	0	0	0	0	59.60%
North Point	Provident Centre	17	20932	13	1	0	0	0	0	59.60%
North Point	Provident Centre	17	20932	1	1	0	0	0	1	79.89%
North Point	Provident Centre	17	20932	17	1	0	0	0	1	79.89%
Tsing Yi	Rivera Gardens	20	52846	9	0	1	0	0	1	56.18%
Tsing Yi	Rivera Gardens	20	52846	1	0	1	0	0	1	55.02%
Tsing Yi	Rivera Gardens	20	52846	2	0	1	0	0	1	55.02%
Tsing Yi	Rivera Gardens	20	52846	20	0	1	0	0	0	50.00%
Tsuen Wan	Bayview Garden	5	14466	1	0	1	0	0	1	52.90%

Data of Part II. Regression Model (Cont'd)

DISTRICT	DEVELOPMENT	NO. OF BLOCK	AREA	BLOCK	VICTORIA	RAMBLER	TYPHOON	INSHORE	VIEW	RATIO
Tsuen Wan	Bayview Garden	5	14466	2	0	1	0	0	1	52.90%
Tsuen Wan	Belvedere Garden ph3	19	22924	1	0	1	0	0	1	50.00%
Tsuen Wan	Belvedere Garden ph3	19	22924	2	0	1	0	0	1	50.00%
Tsuen Wan	Belvedere Garden ph2	19	22924	1	0	1	0	0	0	50.00%
Tsuen Wan	Belvedere Garden ph2	19	22924	2	0	1	0	0	0	50.00%
Aberdeen	Marina Habitat	3	6197	1	0	0	1	0	1	65.26%
Aberdeen	Marina Habitat	3	6197	2	0	0	1	0	1	65.26%
Aberdeen	Sham Wan Towers	3	8490	1	0	0	1	0	0	51.45%
Aberdeen	Sham Wan Towers	3	8490	2	0	0	1	0	0	51.45%
Quarry Bay	Grand Promenade	5	12379	5	0	0	1	0	1	61.41%
Quarry Bay	Grand Promenade	5	12379	6	0	0	1	0	1	61.41%
Tsing Yi	Tierra Verde	12	57875	1	0	1	0	0	0	55.88%
Tsing Yi	Tierra Verde	12	57875	2	0	1	0	0	0	55.88%
Tsing Yi	Tierra Verde	12	57875	10	0	1	0	0	0	61.06%
Tsing Yi	Tierra Verde	12	57875	12	0	1	0	0	0	61.17%
Shau Kei Wan	Les Saisons	4	7057	1	0	0	1	0	1	66.77%
Shau Kei Wan	Les Saisons	4	7057	2	0	0	1	0	1	66.77%